MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2018/2019

ECP3086 – MULTIMEDIA TECHNOLOGY AND APPLICATIONS

(RE)

18 OCTOBER 2018
9.00 a.m – 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 5 pages with 4 Questions only.
2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.

Question 1

a) Describe **THREE** enabling technologies to provide multimedia applications.

[6 marks]

b) Construct HTML codes as Figure Q1 below: (image: Malaysia.jpg, red_card.jpg)

Football : MALAYSIA Super Leage 2018
MALAYSIA : Super Leage
Round 17
27 June 2018 Kuala Lumpur PKNP 1 : 1
27 June 2018 Terengganu Negeri Sembilan 3 : 2
Show more matches

Figure Q1

[12 marks]

c) Consider a string of symbols to be quantized to 4 levels: 0,1,2 and 3. Suppose the possibility of these levels are 1/49, 4/49, 36/49 and 8/49 respectively. Determine:

(i) The optimum encoded symbols by using Huffman coding.

[4 marks]

(ii) Average length of the source.

[2 marks]

(iii)Entropy of the source.

[1 mark]

Continued...

Question 2

a) The increasing amount of data produced by modern image generating and processing systems is often limited by storage and transmission capacity. Effective data compression techniques are necessary to overcome the problem.

With the aid of diagram, describe JPEG coding scheme for lossy compression.

[10 marks]

b) Different colour models are often used in different applications.

(i) What is CMYK colour model?

[1 mark]

(ii) Provide an application in which this color model is mostly used. Justify.

[3 marks]

c) Differential pulse code modulation (DPCM) is an efficient data compression technique, which is useful for reducing transmission rate of digital image information. Given the DC coefficient of the first image blocks are 13, 12, 10, 11, 15 and 17. Construct DPCM-coded DC coefficient represented by a pair of symbol (size, amplitude), where size represent the number of bits needed for the coefficient while amplitude contains the actual bits.

[6 marks]

d) Table Q2(a) shows a window size of 3x3.

Table Q2(a)

114	116	117
110	140	115
105	109	113

Determine:

(i) The value of center pixel after median filtering with window size 3x3.

[2 marks]

(ii) The center pixel value after filtering process using the Laplacian filter in Table Q2(b).

Table Q2(b)

0	-1	0
-1	4	-1
0	-1	0

[3 marks]

Continued...

Question 3

a) A sound card supporting 16-bit is used for recording purpose.

(i) Calculate the largest quantization error if the signal is in the range between -5V to 5V.

[3 marks]

(ii) What is the worst case SQNR can be achieved?

[2 marks]

(iii)If sound card with 32-bit is used, predict the resolution, dynamic range and quantization error.

[3 marks]

b) Figure Q3 shows the Fletcher-Munson Curves which displays the equal loudness response for human ear as a function of frequency. Analyze the curves to obtain perceived loudness of 50dB at 100Hz, 1kHz, 4kHz and 10kHz by considering the range of human hearing and hearing sensitivity respectively.

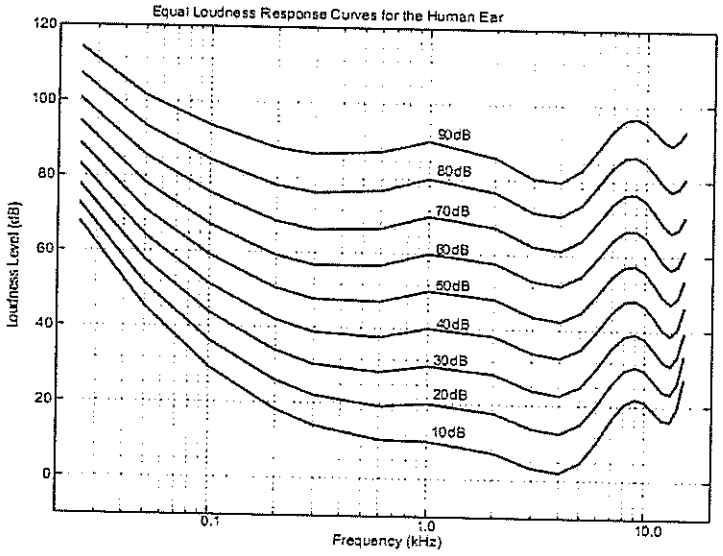

Figure Q3

[8 marks]

c) Psychoacoustics is the study of the perception of sound by human.

(i) Describe **TWO** psychological phenomena that are exploited in MPEG audio compression.

[4 marks]

(ii) With the aid of diagram, outlining how phycological phenomena in (i)are encoded.

[5 marks]

Continued...

Question 4

a) Video streaming service over the internet can be provided either with a client-server or a peer-to-peer approach.

(i) With the aid of a suitable diagram, explain the implementation of a peer-to-peer based video streaming system.

[7 marks]

(ii) Discuss **TWO** advantages of using peer-to-peer over client-server approach.

[4 marks]

b) Given that 2 x 2 macroblock is used as shown in Figure Q4(a). For the following macroblock, the corresponding intensities in the reference frame are given as in Figure Q4(b). Calculate the motion vector with complete search within ±1 pixel search window. Show all the working steps involved to obtain the result.

#	#	#	#
#	6	4	#
#	2	2	#
#	#	#	#

Figure Q4(a)

5	3	6	2
1	4	7	3
4	5	3	3
3	2	3	3

Figure Q4(b)

[10 marks]

c) Determine the memory requirement to store four minutes of uncompressed DVD video, using the following parameters.

(i) Frame rate : 25 frames per second
(ii) DVD video resolution : 720 x 576
(iii)Pixel depth : 24 bits per pixel

Also calculate the compression ratio achieved by MPEG-2 standard in DVD, by assuming that the video bitrate for DVD video is 6 Mbit/s.

[4 marks]

End of paper